

AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions, and listings, of claims in the application:

1. (Currently Amended) A multi-channel matrix decoder module for generating a plurality of audio output signals from a plurality of audio input signals, the audio output signals for generating sound waves in an environment, the decoder module comprising:

[[a]] an input mixer that produces a plurality of input signal pairs using the plurality of audio input signals, each of the plurality of the input signal pairs being non-inverses of one another and directed to different locations in the environment; and

a matrix decoder coupled to the input mixer, the matrix decoder comprising different sections directed to the different locations, each of the sections receiving input from one of the input signal pairs and outputting output signals for the location correlated to the input signal pair received that produces a plurality of output signals as a function of the input signal pairs.

2. (Currently Amended) A method for decoding multi-channel a plurality of audio input signals into a plurality of audio output signals, the audio output signals for generating sound waves in an environment, the method comprising:

creating [[at]] a plurality of input signal pairs as a function of three or more the plurality of input signals, the input signal pairs being non-inverses of one another and for different locations in the environment; and

creating a plurality of output signals as a function of the plurality of input signal pairs using a matrix decoder, the matrix decoder comprising different sections directed to the different locations, each of the sections receiving input from one of the input signal pairs and outputting output signals for the location correlated to the input signal pair received.

3. (Original) A surround processing system, comprising:

a multi-channel matrix decoder module that produces a plurality of output signals; and
an adjustment module that produces a plurality of adjusted output signals, the adjustment module comprising a gain module, an equalizer module and a delay module.

4. (Canceled)
5. (New) The decoder module of claim 1, where the input mixer produces the input signal pairs from three or more audio input signals.
6. (New) The decoder module of Claim 1, where at least one of the input signal pairs produced by the input mixer comprises a rear input signal pair, a side input signal pair, and a front input signal pair.
7. (New) The decoder module of Claim 1, where at least one of the input signal pairs produced by the input mixer comprises a steering angle input signal pair.
8. (New) The decoder module of Claim 7, where the plurality of audio input signals comprises a left-front, a right-front, a left-surround, a right-surround, and a center input signal, and producing the steering angle input pair comprises converting the left-front, the right-front, the left-surround, the right-surround, and the center input signals into the steering angle input pair.
9. (New) The decoder module of Claim 1, where input to each of the sections for the different locations of the matrix decoder consists of the input signal pair received for the different locations and steering angle input.
10. (New) The decoder module of Claim 1, where the sections of the matrix decoder comprises a plurality of submatrices, each submatrix receiving input from one of the plurality of input signal pairs.
11. (New) The decoder module of Claim 10, where the input mixer produces a rear input signal pair; and

where one of the plurality of submatrices comprises a rear submatrix that inputs the rear input signal pair and produces a plurality of rear output signals as a function of the rear input signal pair.

12. (New) The decoder module of Claim 11, where at least one of the signals in the rear input signal pair is produced by the input mixer according to an equation

$$RI1=LFI+0.9\times LSurI-0.38\times RSurI+Gr\times CTRI,$$

where Gr comprises a ratio with the center input signal to control the amount of the center input signal in the rear input signal pair,

LFI comprises a left-front input signal,

LSurI comprises a left-surround input signal, and

CTRI comprises a center input signal.

13. (New) The decoder module of Claim 1, where at least some of the plurality of audio input signals comprise the same locations as at least some of the plurality of audio output signals.

14. (New) The decoder module of Claim 13, where the at least some of the plurality of audio input signals comprise a left-front input signal and a right-front input signal; and

where the at least some of the plurality of audio output signals comprise a left-front output signal and a right-front output signal.

15. (New) The decoder module of Claim 13, where the at least some of the plurality of audio input signals comprises a center input signal; and

where the at least some of the plurality of audio output signals comprise a center output signal.

16. (New) The method of claim 2, where the plurality of input signal pairs is created from three or more audio input signals.

17. (New) The method of Claim 2, where at least one of the input signal pairs produced by the input mixer comprises a rear input signal pair, a side input signal pair, and a front input signal

pair.

18. (New) The method of Claim 2, where at least one of the input signal pairs produced by the input mixer comprises a steering angle input signal pair.

19. (New) The method of Claim 18, where the plurality of audio input signals comprises a left-front, a right-front, a left-surround, a right-surround, and a center input signal, and where creating the steering angle input pair comprises converting the left-front, the right-front, the left-surround, the right-surround, and the center input signals into the steering angle input pair.

20. (New) The method of Claim 2, where input to each of the sections for the different locations of the matrix decoder consists of the input signal pair received for the different locations and steering angle input.

21. (New) The method of Claim 2, where creating a plurality of output signals as a function of the plurality of input signal pairs using a matrix decoder comprises decoding using a plurality submatrices, each submatrix receiving input from one of the plurality of input signal pairs.

22. (New) The method of Claim 21, where creating a plurality of input signal pairs comprises creating a rear input signal pair; and

where one of the plurality of submatrices comprises a rear submatrix that inputs the rear input signal pair and produces a plurality of rear output signals as a function of the rear input signal pair.

23. (New) The method of Claim 22, where at least one of the signals in the rear input signal pair is produced according to an equation $RI1=LFI+0.9\times LSurI-0.38\times RSurI+Gr\times CTRI$,

where Gr comprises a ratio with the center input signal to control the amount of the center input signal in the rear input signal pair,

LFI comprises a left-front input signal,

LSurI comprises a left-surround input signal, and

CTRI comprises a center input signal.

24. (New) The method of Claim 2, further comprising producing an additional audio output signal as a function of one or more of the plurality of audio output signals.

25. (New) The method of Claim 24, where the plurality of audio output signals comprises a side output signal; and

where producing an additional audio output signal comprises producing an additional side output signal.

26. (New) The decoder module of Claim 2, where at least some of the plurality of audio input signals comprise the same locations as at least some of the plurality of audio output signals.

27. (New) The decoder module of Claim 26, where the at least some of the plurality of audio input signals comprise a left-front input signal and a right-front input signal; and

where the at least some of the plurality of audio output signals comprise a left-front output signal and a right-front output signal.

28. (New) The decoder module of Claim 26, where the at least some of the plurality of audio input signals comprises a center input signal; and

where the at least some of the plurality of audio output signals comprise a center output signal.

29. (New) The surround processing system of Claim 3, where the plurality of output signals comprises a first number;

where the plurality of adjusted output signals comprise a second number; and

where the second number is greater than the first number.

30. (New) The surround processing system of Claim 29, where the gain module comprises a plurality of gain units, a number of the plurality of gain units equal to the second number for the plurality of adjusted output signals; and

where at least one of the plurality of output signals is coupled to more than one gain unit.

31. (New) The surround processing system of Claim 30, where the equalizer module comprises a plurality of equalizer units; and

where outputs of the gain units are coupled to a corresponding equalizer unit.

32. (New) The surround processing system of Claim 31, where the delay module comprises a plurality of delay units; and

where outputs of the equalizer units are coupled to a corresponding delay unit.